

manner, some of the more striking phenomena of the earth. The earth as a planet is first referred to, then the materials of which it is composed, which include the composition of the lithosphere, of the atmosphere, and of the hydrosphere. Next are discussed the laws of energy, and the past history of the earth as gathered from its present aspects, while the last chapter is devoted to the evolution of the earth, with sections on spectrum analysis, and theories of planetary origin. To anyone wishing to obtain a general survey of this many-sided subject, physiography, these pages should be of great service. As has been said before, the information in many cases is brief, and in some cases too brief for explanatory purposes. This is, however, counterbalanced to some extent by a number of useful references at the end of each chapter. An appendix, which may prove handy to teachers, gives a list of suitable lantern slides for illustrating the subject-matter.

*Songs of the Russian People.* Collected in the Governments of Arkhangelsk and Olonetz, by Th. M. Istomin and G. O. Dütsch. (St. Petersburg, 1894.)

THE northern provinces of Russia are the parts of the empire where the old popular songs are still kept in the memory of the people in their greatest purity. Elsewhere they are often forgotten, or are altered by the intrusion of modern music, very often of the music-hall type. In 1886 the Russian Geographical Society sent out a small expedition in order to collect the really old popular songs—religious, epic, wedding, and so on—and 119 of them are now published, both words and music, in the above-named collection. The words have been taken down by M. Istomin, and the music by M. Dütsch, who have both had a great deal of previous experience in that sort of work. Several songs of the collection are quite new, but the book's chief value is in the melodies of the epic songs (*byliny*), which now become known for the first time. It had always been supposed that the epic songs had no melodies, and were simply delivered in a sort of monotonous recitative; but it now appears that some of them have their special melodies, grave, most beautiful, and bearing the stamp of great antiquity. A map appended to the book shows the places visited by the expedition.

*Visions of the Interior of the Earth, and of Past, Present, and Future Events.* By H.R. and M.S.H. the Prince of Mantua and Montferrat. (London: Simpkin, Marshall, and Co., 1894.)

"SHADOWS to-night have struck more terror to the soul of Richard,  
Than can the substances of ten thousand soldiers  
Armed in proof, and led by shallow Richmond."

These lines are brought to mind by Prince Mantua's visions, which are calculated to produce a more or less terrifying effect upon the gentle reader. We cannot review the book seriously, for it is merely a record of what the author heard and saw while in a state of trance, and such revelations can hardly add to our knowledge of the earth's interior. Mr. Baxter, and the Society for Psychical Research, may find the volume interesting.

*The Complete Poetical Works of Constance Naden.* (London: Bickers and Son, 1894.)

IN one of his essays, Macaulay, with his usual leaning to antithesis, holds that "as civilisation advances, poetry almost necessarily declines." His opinion was that science and poetry are antagonistic. The late Poet Laureate, however, showed that scientific facts and phenomena could be clothed in language at once poetical and impressive. Miss Constance Naden, who

died at the end of 1889, won for herself a high place among poets of science and philosophy, and her admirers include many distinguished votaries of these branches of knowledge. Astronomy, geology, evolutionary ethics, and the nebular theory are a few of the subjects which inspired her to write, and that in a manner which commands admiration. She was a devoted disciple of Mr. Herbert Spencer, and, indeed, was a witness to the truth of his words: "It is not true that the cultivation of science is necessarily unfriendly to the exercise of imagination and the love of the beautiful. On the contrary, science opens up realms of poetry where, to the unscientific, all is a blank."

### LETTERS TO THE EDITOR.

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#### Some New Facts with regard to "Bennettites."

THE remarkable state of preservation of many Palæozoic plants, and some few Mesozoic forms, has raised palæobotany to a position of considerable importance in certain fields of botanical investigation. Endless synonyms, and specific determinations of more than doubtful value, have not unnaturally prejudiced botanists against the study of plant fossils. The scientific treatment of the mineralised tissues of extinct forms has, however, been productive of exceedingly important data towards the better understanding of the lines of plant evolution. Synthetic types and intermediate forms of plant structure are already fairly abundant, and the various suggestive facts revealed by a study of their remains are gradually assuming a more definite shape.

The genus *Bennettites* is an example of special interest among ancient plant types. This name was introduced by Mr. Carruthers in his important monograph of 1868, on the fossil Cycadean stems from the Secondary rocks of Britain.<sup>1</sup> The excellent preservation of the species *B. Gibsonianus* enabled this observer to give a detailed account of certain reproductive organs, which were embedded in the armour of the persistent petiole bases enclosing the plant stem. The affinities of this species have since been presented in a somewhat different light by Solms-Laubach,<sup>2</sup> and he is led to the conclusion that the *Cycadeæ* are the nearest known allies of the *Bennettitææ*. There are, however, important differences between the two groups which preclude the idea that one has been directly derived from the other. The Marquis of Saporta and various other writers have contributed to the literature of *Bennettites*, and the speculations propounded as to its true position have been numerous enough.

We are indebted to the careful researches of Prof. Lignier, of Caen, for some recent additions to our knowledge of this genus, and his exhaustive monograph carries us a step further towards the solution of the *Bennettites* problem.<sup>2</sup> The specimen which forms the subject of Lignier's work was found by Morier, in 1865, in the Oxfordian beds of Vaches-Noires; two years later the fossil was described by its discoverer as part of a true Cycadean plant. In 1881, Saporta and Marion referred this Oxfordian fruit to the genus *Williamsonia*; and subsequent writers have assigned the fossil to various positions in the plant kingdom.

The specimen of *Bennettites Morierii* (Sap. and Mar.) described by Lignier is ovoid in form, and has a length of 55 mm., with a breadth of 35 mm. At the base a fractured surface reveals the existence of a slightly convex receptacle, from which is given off a compact cluster of long peduncles, each of which bears at its apex an oval seed. The seed-bearing peduncles are surrounded by several involucre bracts closely applied to

<sup>1</sup> *Trans. Linn. Soc.* vol. xxvi., 1870, p. 663.

<sup>2</sup> *Annals Botany*, vol. v., 1890-91, p. 419 (translation from *Bot. Zeit.*, 1890.)

<sup>3</sup> "Végétaux fossiles de Normandie. Structure et affinités du *Bennettites Morierii* (Sap. et Mar.)." With six plates. Octave Lignier. (*Mém. Soc. Linn. Normandie*, vol. xviii., 1894.)

the surface of the fruit. Unfortunately the fruit is isolated, and affords no clue as to the nature of the organ to which it was originally attached. Numerous thin lamellæ occur in association with the seminiferous peduncles; to these Lignier has applied the term interseminal scales. The seeds are arranged side by side close to the upper surface of the mass of peduncles and interseminal scales; the latter pass between and beyond the seeds, and their swollen distal ends form a protective covering to the blunt hemispherical apex of the fruit. In surface view, the upper part of the specimen appears to be made up of a large number of small projecting areas with polygonal bases and rounded summits. Here and there the projections arrange themselves in the form of rosettes round a small central cavity, marking the position of a seed.

**Involucral Bracts.**—Some important facts have been brought to light as the result of a detailed histological examination of these structures by means of a series of transverse sections. In section each bract has the form of an isosceles triangle with the base directed towards the surface of the fruit. The excellent preservation of the tissues affords indisputable evidence of the existence of stomata and numerous lamellar epidermal outgrowths, similar to certain structures described by Carruthers in *B. Gibsonianus*. The most interesting part, perhaps, of Lignier's account of the bract tissue, is the inference he draws from an examination of the course and structure of the several vascular strands traversing each bract. It would seem that the vascular bundles are far from their termination, and that the involucral bracts as shown in the specimen are merely the petiolar portions of leaf-structures, of which the pinnate or flabellate laminae have not been preserved. Immediately underneath one of the scaly hairs of an involucral bract a section has cut through what is apparently a lenticel; in this case, suggests Lignier, lenticel development has probably taken place as the result of irritation consequent on the fall or decay of a hair.

**Seed-bearing Peduncles.**—The main portion of the fruit itself is made up of well-developed peduncles having a length of 30–45 mm., and a diameter of 1.5 mm. Each peduncle consists of fundamental tissue traversed by a single axial bundle, and surrounding the whole there is a very characteristic epidermal layer, which is gradually replaced towards the upper part of the fruit by a "tubular envelope" of variable thickness. This change is probably the result of the elongation of the peduncles, and of the epidermal cells which increased in length without undergoing transverse division, and thus became transformed into tubular elements. A similar alteration of epidermal cells occurs in *B. Gibsonianus*, but in that species its true nature was apparently not recognised by Carruthers and Solms-Laubach.

**Seeds.**—Each peduncle terminates directly in an orthotropous seed with a single integument; the seeds are elliptical below, and assume a tetragonal or pentagonal form towards their apices. In the neighbourhood of the seeds, the tubular envelope of the peduncles is reduced in size, and becomes differentiated into a small tubular, and a folded layer of cells. The former is prolonged to the apex of the seed; the latter retains its special character in the lower half, but towards the upper half of the seed its cells become radially elongated, and give place to a tissue described as the "assise rayonnante." Passing up to the micropylar canal the two layers undergo a further modification; the tubular envelope has now assumed the rôle of an ordinary epidermis, and the "assise rayonnante" passes into a simple sub-epidermal layer of cells. The inner face of the micropyle consists of narrow and radially elongated elements, which become isodiametric as we pass down to the pollen-chamber. The fundamental tissue of the seed-coat is divided into an external fleshy and an internal fibrous portion. In describing the cells of the fleshy part of the integument, Lignier points out that the thin cell walls show here and there numerous fine pits, and the cell cavity contains a dark substance which may possibly represent the remains of protoplasmic and other cell contents. In some cases the contracted protoplasm (*sic*) shows slender prolongations which appear to correspond to the pits in the cell wall; these are interpreted as strands which originally traversed the cellulose walls, and connected cell with cell. It is perhaps questionable how far the tissues of fossil plants will stand the strain of the minute descriptions which characterise the work of some French writers; but if protoplasmic continuity can be thus partially demonstrated in a fossil seed, it suggests possibilities beyond the wildest dreams of palæo-

botanical histologists! The greater part of the nucellus is occupied by a large embryo with two cotyledons. On the whole, the general disposition of the peduncles and seeds is the same as in *B. Gibsonianus*, but various differences in detail sufficiently establish a specific difference.

**Interseminal Scales.**—These may be compared to the scales in a pine cone; they are associated with the seminiferous peduncles, but extend beyond them, and form a continuous protective layer at the exposed surface of the fruit. External to the interseminal scales there are the so-called superficial scales, which have a fairly definite structure, and are not to be confused with the external involuclal bracts.

The above imperfect *résumé* conveys but a poor idea of the thorough and careful treatment of the fossil at the hands of Prof. Lignier.

In his concluding remarks as to the nature of *B. Morierii*, the author of the monograph expresses himself somewhat as follows:—Regarding the supporting trunk as an axis of the first order, the fruit-bearing axis is of the second order, and has its apex contracted in the form of a convex receptacle; the leaves below the receptacle are transformed into involucral bracts, the leaves inserted on the receptacle itself have become interseminal scales, and the seed-bearing peduncles are fertile leaves belonging to unileaved shoots of the third order.

The inflorescence of *Bennettites* is clearly distinguished from that of the Cycads in the following points:—(1) Ovules are terminal and erect; (2) each fertile bud is of a higher order and much reduced; (3) the inflorescence is compound, formed by the grouping together of several fertile shoots, with a supporting branch and its leaves, &c. "The *Bennettites* are therefore posterior to the *Cycadeæ*, at least as regards the reproductive structures."

On the other hand, the inflorescence of *Bennettites* presents many points of agreement with the *Conifera*; e.g. in its compound nature, small seeds, unileaved fertile shoots with erect ovules, &c. The points of difference between *Bennettites* and the *Conifera* include (1) larger number of sterile leaves associated with the single-leaved buds; (2) the position of the fertile shoots, which is not perhaps strictly axillary, &c. Summing up the whole matter, Lignier says:—"I regard the *Bennettites* as a family which has been derived with the Cycads from common ancestors, but not from the Cycads themselves. Of these common ancestors the two families have preserved the form of the trunk, the structure of certain tissues (large pith, gum canals, diploxyloid leaf-traces, and sclerenchymatous mesophyll), the foliar origin of the ovule, &c. But whilst the Cycads have retained a grouping of carpophylls on a single axis, and have acquired special characters, such as the complication of the leaf-trace and the lateral position of the ovules; the *Bennettites* have retained the simple leaf-trace and have acquired a terminal position of the ovules, the reduction of the fertile axes to a single carpophyll, the grouping of these fertile reduced axes, and the modification of the neighbouring leaves as the result of *précurrence sexuelle*.<sup>1</sup> Perhaps the future will bring to light a greater affinity than is at present suspected between the *Bennettites* and certain fossils referred to the *Cordaites*."

A. C. SEWARD.

#### Science Teaching in St. Mary's Hospital Medical School.

MY attention has just been called to an article in the issue of NATURE of September 20, headed "Science in the Medical Schools." This article professes to demonstrate by means of a table, compiled from lists given in the students' number of the *Lancet*, the extent to which instruction in science subjects not purely medical is provided in the medical schools. According to this table, no instruction is provided in biology or zoology, botany, physics, practical physics, bacteriology, and hygiene, or public health, in this medical school. If you will refer to the prospectus of the medical school, which I forward with this letter, you will find that very complete courses of instruction are given in all those subjects here, and that the instruction includes lectures, classes, demonstrations, and laboratory work in all the subjects.

<sup>1</sup> In explanation of this term Lignier adds:—"Je désigne sous le nom de *précurrence sexuelle* le phénomène par lequel certains organes soit porteurs de la glande sexée soit voisins de celle-ci et formés antérieurement à elle, sont peu à peu englobés dans l'appareil sexuel à mesure que celui-ci se complique dans la généalogie des plantes. La *précurrence sexuelle* ainsi comprise se rencontre partout dans le règne végétal."